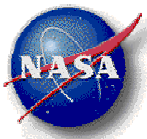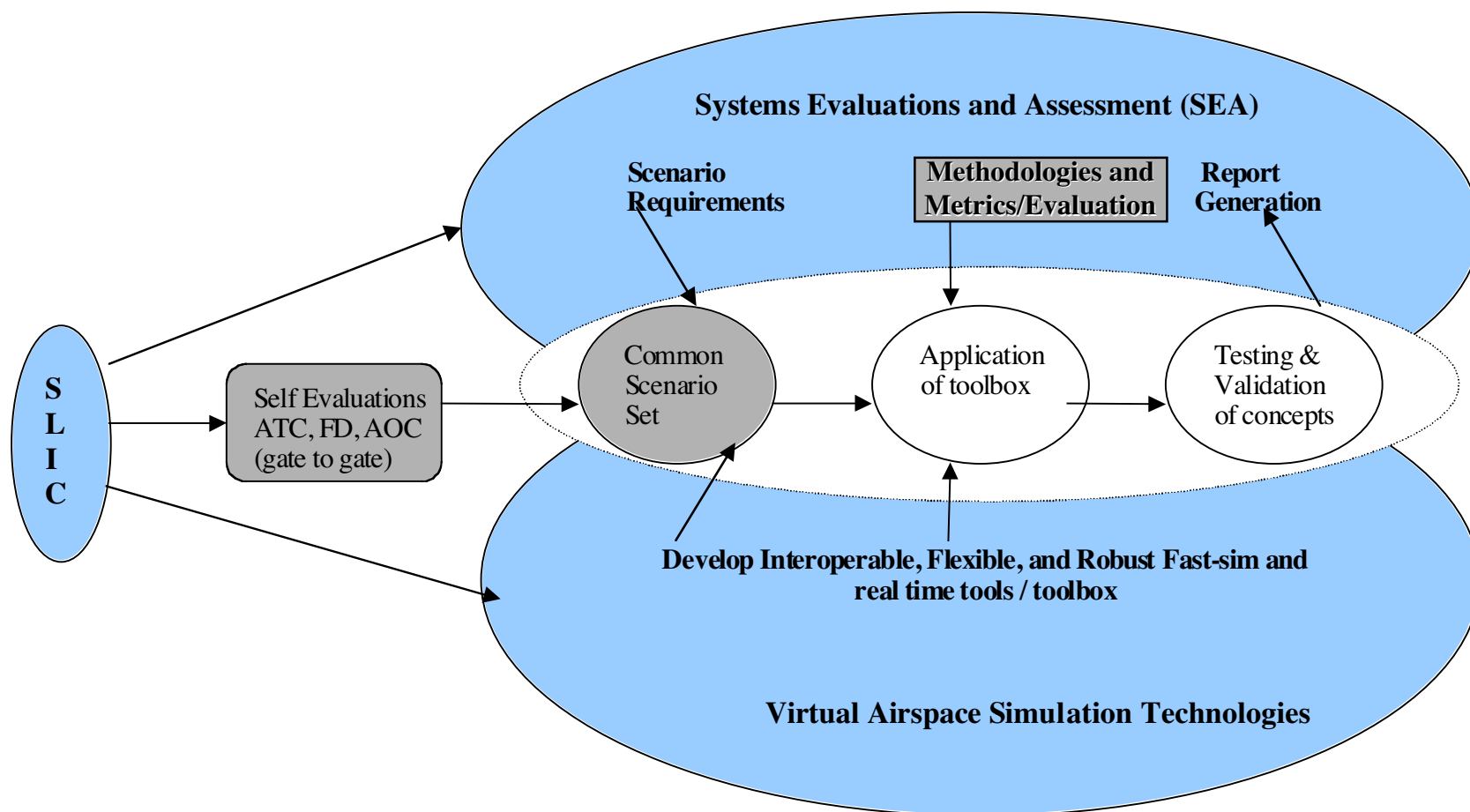# Systems Evaluation and Assessment (SEA) Sub-Element

Common Scenarios and Metrics Requirements

Sandy Lozito
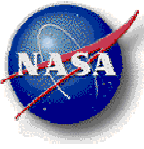
Level 3 Manager

SEA Sub-element

System Evaluation and Assessment Relationship between the Sub elements

Systems Evaluations and Assessment (SEA)

Scenario Requirements

Methodologies and Metrics/Evaluation

Report Generation

SLIC

Self Evaluations ATC, FD, AOC (gate to gate)

Common Scenario Set

Application of toolbox

Testing & Validation of concepts

Develop Interoperable, Flexible, and Robust Fast-sim and real time tools / toolbox

Virtual Airspace Simulation Technologies

Ames Research Center

System Evaluation and Assessment
General Tasks

- **Develop scenarios and metrics for evaluation of the SLIC concepts**

- Conduct an initial validation assessment of the VAST real-time tools

- Conduct an initial assessment of the selected concepts

- Conduct an initial assessment of the integrated concepts

- Conduct the final evaluation of the integrated concept(s) using the VAST tools
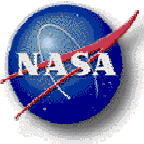
Scenarios/Metrics

- Scenarios and Metrics will be used to help evaluate the concepts from VAMS/System Level Integrated Concepts
  - Initial evaluation of concepts will be self-evaluation
  - The scenarios/metrics for self-evaluation can be used to assist the SEA scenario/metric development
- There can be many scenarios and metrics, but ultimately they must be applicable for broad evaluations
  - Scenarios addressing multiple airspace domain and concepts addressing more specific domains
  - Scenarios addressing multiple parts of the triad (AOC/ATC/FD)
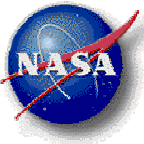
Scenario Requirements

- **Scenarios are necessary for the evaluation of the "capacity-increasing" concepts**

- **Scenarios must test the concepts' ability to increase capacity and maintain (or increase) safety**

- **Scenarios must cover all domains (e.g., surface, terminal, enroute)**

- **Scenarios must consider normal and non-normal events**

- **Scenarios must cover real-time and fast-time testing**

- **Scenarios must test all parts of the NAS triad: AOC, ATC, flight deck**

- **Scenarios must be able to test both single-domain concepts and more broad concepts**

- **SEA is writing the requirements for the scenarios**
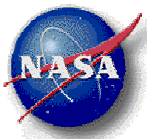
Scenario Parameters within SEA

system

environment

demand

scope

forecast

Metrics/
Evaluation
Criteria

VISUAL INPUT

TIME (SECONDS)
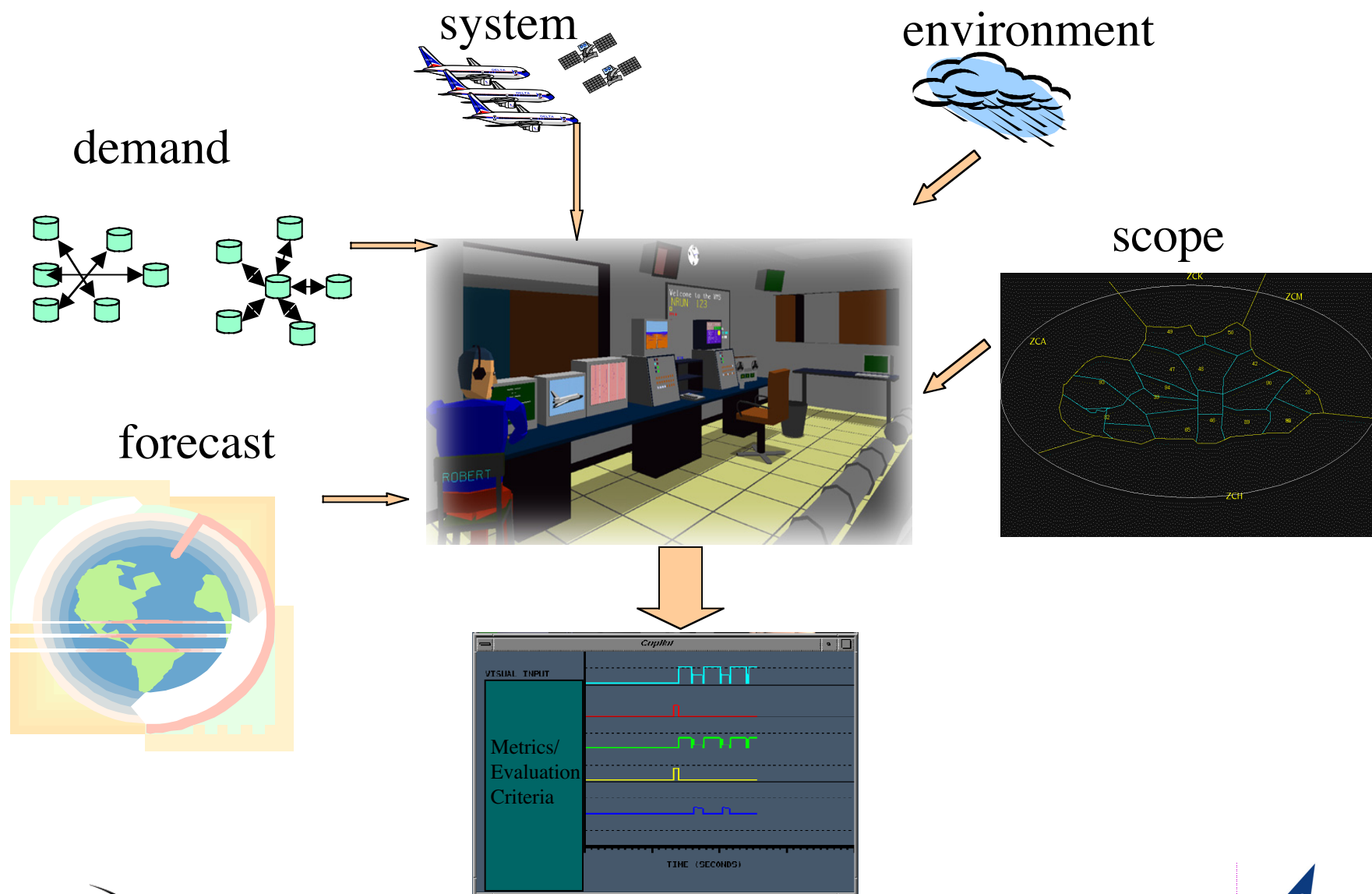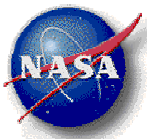
Some Scenario/Metric Parameters

Forecast	Demand	System	Environment	Scope
Economic Activity	Number of Airports	Aircraft Characteristics	Weather	Whole v. part of NAS
Energy Availability	Fleet mix	Airport Characteristics	Safety Situations	Fidelity of the Scenario
War and pestilence	Load factor	Airspace Characteristics	• Operational errors • Reduced Landing Capacity • Aircraft/Vehicle On the Runway	Temporal Resolution
Environmental Concerns	Schedule			Simulation Timing/ Synchronization
Demographics	Origination/ Destination Pair	CNS Infrastructure	Failures	
Travel Confidence		NAS Architecture	Security Situations	
		Humans		

Note: Assume a multiple-day schedule of flights for these scenarios

Framework for Scenario & Metrics Development*

**Stakeholder Viewpoints
(questions to be answered)**

**Stakeholder Viewpoints
(questions to be answered)**

concepts → **operational scenarios** → **NAS Model** → **output metrics** → **evaluation metrics**

1. Scope:
•issues
•NAS Domain
•challenges
•assumptions

2. Top Level Descriptions:
•core ideas
•functions

3. Detailed Descriptions:
•performance
•roles, responsibilities
•@ humans & machine
•human factors
•user interfaces

4. NAS infrastructure & technology impacts:
•transition planning
•architecture
•technology requirements

Scenario Elements:
•NAS Domain
•NAS Perturbations
(e.g. Wx, Security Incidents)
•Origin/Destination Demand
•Assumed Technologies
•Human/Machine Performance
•Defined ATM Procedures
•Assumed Equipage
•Fleet Mix
•Etc.

Simulations

•Number of traffic events (takeoffs, sector crossings, landings, etc.)
•Number of communication events (requests, clearances, directives, etc.)
•throughput (traffic volume)
•Delay
•Safety incidents (proximity to minimum separation, incursions, encroachments, etc.)
•Elapsed flight times
•Fuel burn
•Capital investments
•Personnel workloads
•Etc.

•Average aircraft flight time per air route*
•Average aircraft payload per flight mile
•Operational cost per passenger mile
•Average taxi time from pushback to wheels up during peak traffic periods per specific airports or taxi paths within airports
•Average voice channel occupancy time per departure from pushback to take off
•Average Airport arrival rate during peak periods
•Rate of arrivals per controller hour per airport
•Aircraft (or engine, or other component) maintenance costs per flight mile
•Etc.

* a defined city pair air route

Empiric Analysis

Ames Research Center